

Department of Energy
Washington, D.C. 20545

APR 3 1978

INFORMATION MEMORANDUM

TO: Deputy Secretary
Under Secretary

Original Signed By
James L. Liverman

FROM: Acting Assistant Secretary for Environment

SUBJECT: PALOMARES (PROJECT INDALO), SPAIN

Purpose

To provide the Deputy Secretary and the Under Secretary with information regarding the status of DOE commitments to the Government of Spain and findings and concerns relative to the subject.

Background

- 1) On January 17, 1966, a U.S. Air Force B-52 bomber and a U.S.A.F. jet fuel tanker aircraft collided during refueling operations over the southeastern coast of Spain. Four nuclear weapons carried by the B-52 fell to the earth, of which two were recovered intact and two burned after the high explosive component detonated upon impact. The latter two weapons fell on either side of the village of Palomares: one near the east edge of the village, and one onto a rocky area west of the village (areas 2 and 3 on the attached map - Tab A).
- 2) The burning of the weapons resulted in substantial plutonium contamination of the surrounding areas. Extensive efforts were organized immediately to define the areas and levels of contamination, to remove fragments of the weapons and planes, and to decontaminate the area to the extent considered necessary. U.S. Air Force troops were used to accomplish the cleanup.
- 3) Ultimately the most heavily contaminated areas (around the impact sites and downwind from the sites) were decontaminated by removing the top few centimeters of soil, which was placed in steel drums and transported to the United States for burial at Savannah River.

3,2 x 10⁻⁷ Ci/100 cm²

ATCUB

Much of the remaining contaminated land under cultivation was deep plowed to dilute the plutonium and to reduce its concentration to negotiated levels which were considered to be acceptable to Spain and to the U.S. The lands not under cultivation, due mostly to their rocky character and/or poor accessibility, were raked and watered in an attempt to fix the plutonium to the soil and prevent its resuspension.

- 4) The initial interaction between the United States and Spain resulted in the Otero-Hall agreement (copy attached, see Tab B) between the two countries. It was signed in Madrid in March 1966 by the Atomic Energy Commission on behalf of the U.S., and by the Junta de Energia Nuclear on behalf of Spain, and called for a four-point follow-up program and associated U.S. and Spanish responsibilities. This program became known as Project Indalo. Basically, the agreement was designed to obtain information in four areas:
 - a) Uptake and excretion of plutonium and uranium by a population group;
 - b) Resuspension of plutonium from contaminated soil;
 - c) Internal and external contamination of agricultural products;
 - d) Temporal migration and redistribution of plutonium oxide in soil.
- 5) The Spanish research and follow-up program has proceeded at a relatively low level since 1966. It has been supported by a small commitment of U.S. funds (see Tab C) which amounts currently to 10-15 percent of the total program cost. There has been a fairly large commitment of equipment from the U.S., however.
- 6) As a result of the measuring, monitoring, and sampling activities, it is apparent that area 3 was decontaminated quite well. Little plutonium has been detected in air, water, or plants from this area since 1966.
- 7) Area 2 was not decontaminated to the same extent, due in part to its rocky character and difficulty of accessibility and in part because it was not extensively used as cropland. Environmental monitoring revealed no movement of plutonium in this area until the early '70's. Within the past two years the local farmers, pressed for arable land to raise their principal cash crop of tomatoes, began to farm the less desirable farm land near the area 2 impact point. This has

resulted in considerable resuspension of plutonium, contaminating not only the tomatoes grown in area 2, but also grain crops (barley and corn) grown as much as one-half mile downwind.

- 8) Since 1972 Dr. Chester R. Richmond, Associate Director of the Oak Ridge National Laboratory, and Mr. Phillip N. Dean, Lawrence Livermore Laboratory, have served as consultants to the Spanish Government. Mr. Dean, who serves as an advisor on electronic and equipment facilities, visits Spain approximately yearly, and Dr. Richmond, who serves as a scientific advisor, exchanges visits with his Spanish counterpart about every 1½-2 years.

Discussion

We and our scientific advisors believe that it is time for a major re-evaluation of "Project Indalo" and of the U.S. contribution and role in it. This is based upon several factors:

- 1) Backlog: There is a large backlog of environmental samples resulting in delays of a year or more between the time a sample is taken and the time it is analyzed for plutonium. This backlog must be eliminated so that real time analyses can be made; this will permit detection of the movement of plutonium and of potential problems as they arise rather than up to a year later. Reduction of this backlog can be accomplished only through additional equipment provided by the United States.
- 2) Environmental Monitoring: Because of the increased agricultural activity in area 2, increased monitoring of air, soil and vegetation samples is necessary to ascertain movement of the plutonium and to obtain more accurate surface concentration measurements of plutonium in this area. Some time ago two of the four air monitoring stations, one of which was strategically located with respect to the newly cultivated areas, ceased to function. These should be replaced. In addition, examination of native and domestic fauna, as well as flora, may be useful.
- 3) Decontamination: Depending upon the findings resulting from increased monitoring of area 2, it may be necessary to consider additional decontamination alternatives.
- 4) Personnel Monitoring: A more intensive and controlled monitoring program is needed. This involves transport of the individuals to Madrid for several days for chest counting (for radioactivity in the lung), for medical examination, and for excreta collection.

57014

57014

- 57014

57014

won a judgment in the Spanish Supreme Court. Although this suit was not related to plutonium, it was related to property damaged by the U.S. military at the time of the cleanup, and the precedent of legal restitution for damaged property has been established.

Summary

In view of the lack of definitive data on the residents of Palomares, and because of the redistribution of plutonium in area 2, it is incumbent upon the U.S. to increase its efforts to support the objectives of the Otero-Hall agreement.

Therefore, from several U.S. and Spanish perspectives, the U.S. must reassess its commitment to and the direction of this activity. Consequently, I have directed Dr. Richmond, Mr. Dean and Dr. Bruce Wachholz (of my staff) to provide within the next few months a detailed scope and protocol of the entire effort and to identify what financial, personnel and equipment resources might be required. After our position is agreed upon, we will discuss it with the appropriate Spanish authorities. There seems to be little doubt that this activity will require an increased commitment from the United States and from the Department of Energy.

Finally, it must be stated that most of the funding and almost all of the work has been carried out by the Spanish. They are competent and astute in all matters, and their relationships with us and with the villagers have been excellent. Their continued understanding and cooperation are critical to the success of the program.

Attachments:

Tab A - Map of Palomares
Tab B - Otero-Hall Agreement
Tab C - U.S. Funding for Project Indalo

cc: Ms. Thomas, IA
Mr. Robertson, IA
Mr. Greenleigh, GC
Mr. Zanetell, CR
Mr. Cannon, IR
Maj. Gen. Bratton, DP
Mr. Thorne, ET
Mr. Leith, EV

Prepared by: EV/OTI: BWachholz/lh: 353-4365: 3/23/78

Plutonium isopleths -- Palomares, Spain.

AREA 2

AREA 5

AREA 3

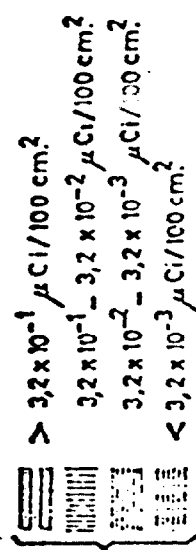
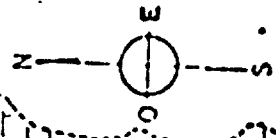
Station 3.

Station 2-2

PALOMARES

Station P.

ALMANZORA RIVER



ALPHA CONTAMINATION

IN SOILS

Soil sampling areas



© AIR SAMPLING AND METEOROLOGICAL STATION.

C O P Y

Madrid, Spain,
February 25, 1966.

Dear Professor Otero:

Pursuant to our Agreement for Cooperation for Civil Uses of Atomic Energy between Spain and the United States I wish to propose that we expand our collaboration in the fields of health and safety. Accordingly, on behalf of the United States Atomic Energy Commission and in accordance with the relevant articles in our Agreement for Cooperation of August 16, 1957, as amended, I suggest we investigate various health and safety aspects of fissionable materials when released into a rural agricultural environment.

Collaborative investigations shall be initiated as soon as possible of the physiological and ecological behavior of plutonium oxide in a previously contaminated rural area that has been decontaminated in accordance with mutually agreed upon decontamination limits and procedures. More specifically the investigations shall consist of the points I have set forth in the attached annex to this letter.

It is understood that information considered essential to our collaboration shall be shared freely by the two agencies as well as all information derived from these investigations. It is further understood that the results derived shall not be released to the public without the concurrence of the two agencies.

If these

Excmo. Sr. D. Jose¹ María Otero Navascues,
Marques de Hermosilla,
Presidente de la Junta de
Energía Nuclear,
Avenida Complutense 22,
Ciudad Universitaria.

C O P Y

-2-

If these proposals are acceptable to you, I suggest that this letter and your letter of acceptance shall constitute an understanding on these subjects between our two agencies.

Sincerely,

John A. Hall
Assistant General Manager for
International Activities
ATOMIC ENERGY COMMISSION

Enclosure: Annex

C O P Y

A N N E X

1. Collection of information on uptake and retention of plutonium and uranium by representative numbers of a population group potentially exposed to inhalation of a plutonium oxide aerosol,
2. measurement of temporal and seasonal fluctuations in plutonium air concentrations above a plutonium oxide contamination agricultural area that has been subjected to the agreed upon decontamination procedures,
3. serial measurements of contamination levels (both by plant uptake from the soil and wind dispersal) of agricultural products produced in a contaminated area subsequent to decontamination and,
4. studies of the temporal migration and redistribution of plutonium oxide in soil, decontaminated by deep plowing, as a result of continued cultivation and weathering.

C O P Y

C O P Y

Page 2 of

Annex

The Junta will assume the position of principal investigator with the U.S.A.E.C. providing support in the form of technical assistance and advice and specialized equipment and materials not readily available to the Junta.

In the role of principal investigator the Junta will assume responsibility for the following:

1. Provision of building and laboratory space required to initiate and carry on the program.
2. Establishment, with the help of U.S. specialists, of sampling methods, routines and schedules for population, air, produce and soil measurements.
3. Provision of logistic support required by sampling and measuring schedules.
4. Performance of all scientific measurements and tests.
5. Compilation and documentation of all scientific data.
6. Provision of travel for its own specialists sent to the United States for consultation, planning or training purposes.

Page 3 of

Annex

In the role of secondary investigator, the U.S.A.E.C. will assume responsibility for the following:

1. Provision, either through funding or by transfer, of specialized equipment and material required by the program. During the first year this will consist of:
 - a. A whole body counter, complete with crystal spectrometer and plutonium X-ray detector.
 - b. One (8 place) scintillation alpha counter of the type currently in use at the Los Alamos Scientific Laboratory or the New York Health and Safety Laboratory.
 - c. One alpha spectrometer complete with multi-channel analyzer and data read-out equipment.
 - d. Additional, less specialized equipment, such as analytical balances, centrifuges, special chemicals, etc., in the amount of approximately \$15,000.
 - e. Plutonium and uranium analytical standards.

C O P Y

Page 4 of

Annex

- f. Four generator-powered Hi-Vol air samplers of the latest design for continuous field operation.
2. Provision of a visiting specialist to install and calibrate the whole body counter and to train Junta personnel in its use.
3. Provision of visiting specialists in methods of plutonium and uranium analysis, to install specialized analytical equipment and train Junta personnel in techniques of plutonium and uranium measurement which are used in the United States, published and unpublished.
4. Provision of a visiting specialist in soil and plant sciences to help develop the studies of plutonium translocation in the soil and its uptake by cultivated crops.
5. Continued provision, beyond the first year, of specialized equipment, technical assistance and advice for as long as both parties mutually agree to be desirable on the basis of the observations as they are obtained.

C O P Y

U. S. FUNDING TO THE
GOVERNMENT OF SPAIN (PROJECT INDALO)

FY 67	\$12,500
FY 68	\$29,000
FY 69	\$37,500
FY 70	\$25,000
FY 71	\$25,000
FY 72	\$25,000
FY 73	\$25,000
FY 74	\$25,000
FY 75	\$25,000
FY 76	\$27,000
FY 77	\$50,000
FY 78	\$50,000